

CLAIMS

1. A subassembly of a folding tool, comprising:
- (a) a first tool member having a base;
 - 5 (b) a first frame side member having an integral first flange extending laterally from said first side member;
 - (c) an elongate first spring, separate from said side member and having a pair of
10 longitudinally opposite free ends, said first spring resting against said first flange intermediate said ends; and
 - (d) a force-resisting member, wherein one end of said first spring rests against said
15 force-resisting member, said other end of said first spring rests against said base of said first tool member, and said first spring is held between said first flange, said force-resisting member and said base.

20

2. A subassembly according to claim 1 wherein said first spring has a central portion resting against said first flange.

25

3. A subassembly according to claim 1 wherein said first spring has a back side and a front side, said back side resting against said first flange intermediate

said ends, and said front side at said ends resting respectively against said force-resisting member and said base.

5 4. A subassembly according to claim 1 wherein said first flange has an inner face adjacent said first side frame member and facing said first spring, said first spring resting against inner face.

10 5. A subassembly according to claim 4 wherein said first spring has a central portion resting against said inner face.

 6. A subassembly according to claim 1 wherein
15 said force-resisting member is a base of a second folding tool member.

 7. A subassembly according to claim 6 wherein
20 one of said first or second folding tool members is one of a pair of jawlike members.

 8. A subassembly according to claim 7 wherein
said first spring includes a locator extending away from said flange and wherein said one of said pair of jawlike
25 members is in contact with said locator when said tool member is in said folded position.

9. A subassembly according to claim 1 wherein said force-resisting member is a spacer.

10. A subassembly according to claim 1 wherein
5 said spring includes a pair of abutment shoulders cooperating with said first flange to restrict longitudinal movement of said spring with respect to said flange.

10 11. A subassembly according to claim 1 wherein said ends of said first spring are respectively elastically biased into contact with said base and said force-resisting member.

15 12. A subassembly according to claim 1, further including a second frame side member, said first and second frame side members being joined by said first flange so as to form a channel capable of accepting said first spring.

20

13. A subassembly according to claim 12, further including a second tool member, between said first and second frame side members.

14. A subassembly according to claim 12,
including a second spring between said first and second
frame side members.

5 15. A subassembly according to claim 13,
including two or more tool members between said first and
second frame side members, each of said tool members
having a base in contact with one or more springs.

10 16. A subassembly according to claim 1,
including a first pivot axle extending through said first
frame side member at a first end thereof.

 17. A subassembly according to claim 16,
15 including a retainer located on said first pivot axle
alongside said first spring and said first tool member,
adjacent a side of said first tool member opposite said
first frame side member, said retainer preventing said
first spring and said first tool member from moving
20 laterally out of engagement with each other.

 18. A subassembly according to claim 17
wherein said retainer is a second frame side member side.

25 19. A subassembly according to claim 16,
wherein said first pivot axle extends through said base

of said first tool member enabling pivoting movement of said first tool member between a deployed position and a folded position with respect to said first frame side member.

5

20. A subassembly according to claim 16, including a second frame side member, said first pivot axle extending through said second frame side member at a first end thereof.

10

21. A subassembly according to claim 1, further including a second frame side member, said first and second frame side members defining a channel therebetween capable of receiving said tool member.

15

22. A subassembly according to claim 19, including a second pivot axle wherein said second pivot axle extends through said second frame side member at a second end thereof.

20

23. A subassembly according to claim 22 wherein said first spring has a length about equal to a center-to-center distance between said pivot axles.

25

24. A subassembly according to claim 1, including a second frame side member having a second

integral flange forming a channel therebetween, and further including a second spring in said channel.

25. A subassembly according to claim 1 wherein
5 said first spring is symmetrical about a transverse plane.

26. A subassembly according to claim 1 wherein
said first frame side member is symmetrical about a
10 transverse plane.

27. A subassembly according to claim 1,
including a second side frame member having an integral
second flange, both of said first and second flanges
15 having respective inner faces, one of said inner faces
facing an opposite direction with respect to the other
inner face.

28. A subassembly according to claim 27,
20 including a second spring resting against said second
flange.

29. A subassembly according to claim 1 wherein
said first frame side member includes a pair of opposite
25 ends, said first flange being located intermediate said
ends, and said subassembly further including a pair of

pivot axles extending through said first frame side member at opposite ends thereof.

30. A subassembly of a folding tool,
- 5 comprising:
- (a) a first frame side member having a pair of opposite ends;
 - (b) a pivot axle, extending laterally from said first frame side member at a
10 respective one of said opposite ends thereof;
 - (c) a fastener extending laterally from said first frame side member at the other one of said opposite ends thereof;
 - 15 (d) a tool bit having a base attached to said first frame side member by a pivot pin spaced apart from and located generally between said pivot axle and said fastener, said tool bit being movable about said
20 pivot pin between two positions, and said base of said tool bit having a pair of engagement surfaces each corresponding to one of said two positions; and
 - 25 (e) a spring having a pair of opposite ends, a first one of said pair of opposite ends being mounted on said pivot axle, and the

other one of said pair of opposite ends
being mounted on said fastener, and said
spring including a central portion aligned
with and biased into contact with said
5 base of said tool bit, said central
portion of said spring being spaced apart
from said flange and having clearance to
move toward said flange, and said spring
tending to hold said tool bit in a
10 respective one of said two positions when
said spring is in contact with a
respective one of said pair of engagement
surfaces.

15 31. A folding multipurpose tool including a
pair of pivotally interconnected crossed members and a
pair of handles, each connected to a respective one of
said pair of crossed members, at least one of said
handles comprising:

20 (a) a first frame side member having a pair of
opposite ends and a flange member located
between said opposite ends and extending
laterally from said frame side member,
said flange having an inner side and a
25 pair of opposite end faces;

- (b) a pivot axle extending laterally from said first frame side member at a first one of said opposite ends thereof;
- (c) a spring-supporting member extending laterally from said first frame side member at the other one of said opposite ends thereof; and
- (d) a first one of said crossed members having a base mounted on said pivot axle for pivoting movement about said pivot axle between a deployed position and a folded position with respect to said first frame side member; and
- (e) a first elongate beam spring having a pair of opposite end portions and a central portion, a first one of said end portions resting on said base portion of said first one of said crossed members and being elastically biased into contact against said base, the other one of said pair of opposite end portions of said spring resting on said spring-supporting member and being elastically biased into contact with a surface of said spring-supporting member, and said central portion of said spring including a back side supported by

said inner side of said flange and a pair of abutment surfaces each located adjacent and facing toward a respective one of said end faces of said flange, said end faces of said flange and said abutment surfaces of said spring cooperatively restricting longitudinal movement of said spring with respect to said frame side member.

32. The folding multipurpose tool of claim 31 wherein said pair of crossed members is a pair of pliers jaws.

33. The folding multipurpose tool of claim 31, said at least one of said handles further comprising a second said elongate beam spring located alongside said first spring, said second elongate beam spring having a first end portion resting on said base portion of said first one of said crossed members, and wherein a central portion of said second spring includes a respective back side supported by said inner side of said flange member and a pair of abutment shoulders each adjacent and facing toward a respective one of said end faces of said flange.

34. A subassembly of a folding tool,
comprising:

- (a) a first tool member having a base;
- (b) an elongate first frame side member having
5 a first flange extending laterally
therefrom;
- (c) a first pivot axle extending transversely
with respect to said first frame side
member, said first tool member being
10 pivotably mounted on said first pivot
axle;
- (d) an elongate first spring separate from
said first frame side member and extending
longitudinally with respect to said first
15 frame side member, said spring having a
free end portion resting against said base
of said first tool member, a hook portion
longitudinally opposite said free end, and
a middle portion between said free end
20 portion and said hook portion; and
- (e) a spring retainer extending transversely
with respect to said first frame side
member, said first spring being held
between said base, said first flange, and
25 said spring retainer, with said hook
portion engaged with said spring retainer

and said central portion engaged with said first flange, whereby said first flange and said spring retainer each prevent said first spring from moving longitudinally in at least one direction with respect to said first frame side member.

35. The subassembly of claim 34 wherein said spring retainer is a second pivot axle.

36. The subassembly of claim 35 wherein a second tool member is pivotably mounted to said second pivot axle.

37. The subassembly of claim 34 wherein said first frame side member has a pair of opposite first and second ends and said first pivot axle is located at said first end.

38. The subassembly of claim 37 wherein said first flange has a first end and a second end, said first end of said first flange facing toward said first end of said frame side member and said second end of said first flange facing toward and being located proximate said spring retainer yet being spaced far enough from said spring retainer to permit said first spring to be

installed with respect to said first frame side member by
inserting said first spring between said second end of
said first flange and said spring retainer, placing said
hook portion into engagement at least partially around
5 said spring retainer, and then placing said central
portion into engagement with said first flange.

39. The subassembly of claim 37 wherein said
spring retainer is located at said second end of said
10 first frame side member.

40. The subassembly of claim 34 wherein said
first flange has a first end engagable with said first
spring to prevent said first spring from moving
15 longitudinally toward said spring retainer.

41. The subassembly of claim 34 wherein said
base of said first tool member includes an abutment face
and said free end portion of said spring includes a tip,
20 and wherein said abutment face rests against said tip
when said tool member is in a deployed position.

42. The subassembly of claim 34 wherein said
first tool member is a first one of a pair of pliers
25 jaws.

43. The subassembly of claim 34 wherein said first tool member is a first one of a pair of scissors.

44. The subassembly of claim 34 wherein said
5 first spring includes a shoulder engagable with said first flange to restrict longitudinal movement of said first spring with respect to said first frame side member.

10 45. The subassembly of claim 34 wherein said first spring is restrained from moving longitudinally with respect to said first frame side member in one direction by said spring retainer and restrained from moving longitudinally in the opposite direction by said
15 first flange.

46. The subassembly of claim 34 including an elongate second frame side member alongside and spaced apart from said first frame side member.

20

47. The subassembly of claim 46 wherein said first flange extends between said first frame side member and said second frame side member and interconnects said first frame side member with said second frame side
25 member, said first and second frame side members and said

first flange defining a central channel, and said first spring being located within said central channel.

48. A subassembly of a folding tool,
- 5 comprising:
- (a) a first tool member having a base;
 - (b) an elongate first frame side member having a spring stop extending laterally therefrom;
 - 10 (c) a first pivot axle extending transversely with respect to said first frame side member, said first tool member being pivotably mounted on said first pivot axle;
 - 15 (d) an elongate, longitudinally extending first spring having a resilient tip at one end, a hook at a longitudinally opposite end, and a middle portion having a back; and
 - 20 (e) a spring retainer extending transversely with respect to said first frame side member, said first spring being arranged with said tip pressing on said base of said first tool member and said hook
 - 25 extending at least partially around said

spring retainer, and wherein said spring stop is engaged with said back.

49. The subassembly of claim 48 wherein said
5 first pivot axle and said first tool member are located proximate a first end of said first frame side member and said spring retainer is located proximate a second, longitudinally opposite, end of said first frame side member.

10

50. The subassembly of claim 48 wherein said spring retainer is a second pivot axle.

51. The subassembly of claim 48 further
15 including a second frame side member spaced apart from said first frame side member.

52. The subassembly of claim 48 wherein said spring retainer restrains movement of said first spring
20 in a first longitudinal direction and engagement of said first spring with said spring stop restrains movement of said first spring in an opposite direction.

53. A method of assembling a tool of the type
25 having:

a first tool member having a base;
an elongate first frame side member having a
spring stop extending laterally therefrom;
a first pivot axle capable of rotatably
5 mounting said first tool member to said first
frame side member;
an elongate, longitudinally extending first
spring having a resilient tip at one end, a
hook at a longitudinally opposite end, and a
10 middle portion having a back; and
a spring retainer extending transversely with
respect to said first frame side member, said
method comprising:

(a) engaging said first spring with
15 said spring retainer by placing
said hook of said first spring
at least partially around said
spring retainer;

(b) thereafter, positioning said
20 first spring with respect to
said first frame side member by
rotating said spring around said
spring retainer until said back
of said first spring is against
25 said spring stop;

- 5 (c) rotatably attaching said first tool member to said first frame side member by passing said first pivot axle through aligned bores defined respectively in said base of said first tool member and said first frame side member; and
- 10 (d) operatively engaging said base of said first tool member with said first spring by urging said first spring against said spring stop and into a flexed condition and thereafter aligning said
- 15 base of first tool member with said resilient tip of said first spring while keeping said first spring flexed.

20 54. The method of claim 53 wherein said spring stop comprises an integral flange extending laterally from said first frame side member.

25 55. The method of claim 53 wherein said spring stop and said spring retainer define an opening

therebetween, said method including engaging said first spring with said first spring retainer by passing said first spring through said opening until said spring retainer is at least partially received in said hook.